

## **4.0 TECHNICAL GUIDANCE**

The environmental objective of TMDL implementation is to meet water quality standards, which protect the physical, biological and chemical integrity of waterbodies. This Guidance goes beyond implementing TMDLs for impaired waters by also addressing the protection of healthy waters to avoid the need for TMDLs. This section is organized to address protection of water quality (Section 4.2), restoration of water quality (Section 4.3), and maintenance of water quality that has been restored (Section 4.4). Before addressing each of those sections, several preliminary matters are addressed in Section 4.1.

As noted elsewhere in the 2006 Guidance, State and local government representatives will continue to refine the document during the coming years. Much of that effort will focus on elements discussed in this technical section. In that light, the following sections may be viewed as a road map for steering future refinements to the implementation process.

### **4.1 Preliminaries**

As discussed in the background Section 2.0, new types of TMDL analyses are still being developed. In particular, TMDL analysis methodologies for addressing biological impairments of non-tidal streams are still under development. TMDLs for this type of impairment could take a “non-traditional” form in which the TMDL is quantified as implementation actions needed to restore the water quality (See Section 2.3.3). Aside from encouraging current efforts to protect and restore the integrity of non-tidal streams, this subject remains beyond the scope of the current version of this Technical Guidance. The remainder of this Technical Guidance will focus on traditional TMDLs that are expressed in terms of the mass of pollutant per unit time (loads).

TMDLs are expressed in a way that is one step removed from directly measuring the achievement of water quality standards. Because TMDLs are set to meet standards, the implementation of control practices that meet the loading goal of a TMDL should also achieve the water quality standards. This allows routine management decisions to be made by accounting for pollutant loads. By providing a link between implementation practices and water quality standards, TMDL analyses serve as a planning guide for restoring impaired waters. Ultimately, however, the success of achieving pollutant loading goals must be verified by the direct measurement of water quality.

Before proceeding, the concept of “TMDL Implementation Plans” deserves introduction. This Guidance provides broad strategic direction, rather than a “how to” on developing TMDL implementation plans. Implementation plans traditionally focus on restoring impaired waters by identifying cost-effective actions to reduce pollution. Implementation planning from this traditional perspective is addressed in Section 4.3 on water quality restoration.

In addition to this traditional perspective, this Guidance considers a more comprehensive view that recognizes linkages between protecting healthy waters and restoring impaired waters. Careful accounting of pollutant loads associated with routine governmental decisions will help ensure that opportunities for pollution reduction are linked to requests for pollutant increases. This strategic view envisions institutionalizing technical and administrative procedures for

managing pollutant loads within many units of government, not merely those that have traditionally been responsible for water quality management.

## **4.2 Defining and Protecting “Healthy” Water Quality**

Water quality standards address the federal requirement “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters” (Clean Water Act §101). Standards have been established to support beneficial uses such as fishing, aquatic life, contact recreation (swimming), boating, drinking (source water), and terrestrial wildlife that depend on water. The term “healthy” applies to those waters that can support or “attain” all of the beneficial uses designated for a given waterbody, allowing for natural limitations (e.g., blackwater swamps on the Eastern Shore of Maryland have naturally low dissolved oxygen levels).

The broad term “water quality standards” encompasses three elements, which include the adoption of designated uses, described above, and criteria that indicate whether or not the designated uses are being achieved. Criteria are expressed in narrative and numeric forms, which are promulgated in regulations. A narrative criterion is a descriptive statement expressing expectations, such as “supporting aquatic life and wildlife”, or invoking professional judgment, e.g., the consideration of surveys conducted by professional sanitarian when interpreting bacteria criteria. As the name implies, numeric criterion are key environmental parameters that determine the threshold between healthy and unhealthy waters. Examples include, minimum acceptable concentrations of dissolved oxygen, maximum concentrations of toxic contaminants, and maximum cell counts of bacteria to protect human health associated with swimming beaches and shellfish harvesting.

The third element of water quality standards is a required antidegradation policy to protect waters at three tiers of quality ranging from 1) meeting existing minimum designated uses, to 2) maintaining high quality where it is better than the minimum requirements, and 3) maintaining outstanding waters with special or sensitive communities (e.g., highly diverse communities) that may not be impacted. The policy must also contain procedures for implementing the goals of the policy, that is, “how” each tier of water quality is to be protected. Maryland does not currently have any waters designated for this third category.

The first tier of water quality is the one with which most readers are familiar. For the first tier, impacts of human activities are managed under the Clean Water Act through permitting only discharges that will not prevent the attainment of designated uses. This includes TMDL development that helps inform the permit limits and implementation for impaired waters (waters that fail to meet the first tier of quality) to bring them back into attainment. Protection of the first tier is analogous to “maintaining” water quality, as described in Section 4.4 below. Potential impacts of human activities are closely reviewed and managed for the second tier of water quality under Maryland’s Antidegradation Policy Implementation Procedures (COMAR 26.08.02.04) presented below.

### **4.2.1 Three Tiers of Water Quality**

The three tiers of water quality adopted by Maryland are described in more detail below.

Tier 1 specifies the minimum standard that must be met, that is, the support of balanced indigenous populations of aquatic life and support of contact recreation, which is often referred to as "fishable-swimmable" (CWA § 101(a)(2)). This is the quality of water that protects all designated uses, which include "existing uses." An existing use can be determined by demonstrating that a particular use actually occurred as of November 28, 1975, or that the water quality is currently suitable to support such uses. Where an existing use is determined, it must be protected even if it is not codified in the water quality standards as a designated use. Tier 1 requirements are applicable to all surface waters.

Tier 2 specifies an existing high quality water that is better than the minimum needed to support "fishable-swimmable" uses. Water quality can be slightly impacted; however, the State antidegradation policy identifies procedures that must be followed before an impact to Tier 2 water quality can be allowed. In no case may water quality be lowered to a level that would interfere with existing or designated uses, unless a use attainability analysis is conducted to revise the designated use (See Section 2.1.1 "Water Quality Standards.").

Tier 3 specifies a particularly special level of water quality deserving to be classified as an Outstanding National Resource Water (ONRW). ONRWs generally include the highest quality waters of the United States. The ONRW classification also offers special protection for waters of exceptional ecological significance, i.e., those that are important, unique, or sensitive ecologically. Except for certain temporary changes, ONRW quality may not be impacted. Decisions regarding which waterbodies qualify to be ONRWs are made by the states. At present, Maryland has not identified any Tier 3 waters; however, this classification and procedures for establishing such waters do exist in State regulation.

#### **4.2.2 Adopting Tier II Waters**

Maryland's antidegradation policy follows the national model required by the US EPA, which includes three tiers of water quality described above. The antidegradation policies can be found in the Code of Maryland Regulations (COMAR) at 26.08.02.04, 04-1, and 04-2.

This section provides a brief introduction to Maryland's policies for identifying and adopting Tier II water quality protection for specific waterbodies.

In June 2004, the State adopted, through the normal regulatory process, about 85 non-tidal stream segments as Tier II waters based on observations of high quality biological communities as demonstrated by high Maryland Biological Stream Survey scores (> 4.0 on a 1 to 5 scale). Tier II water quality can also be documented based on water quality data using a statistical approach (90 percent confidence interval exclusion) and more waters will likely be identified on this basis in the future.

The Tier II designation applies only to the stream segment from which data is collected and analyzed. The stream segment is defined as the part of the stream that lies between the upstream and downstream confluences of major tributaries entering the stream. This approach to designating Tier II stream segments can result in very small stream segments to which the

antidegradation implementation policy applies explicitly. However, the Clean Water Act also requires the protection of downstream water quality, creating an implicit protection of Tier II waters from upstream impacts. Consequently, activities proposed upstream of Tier II segments need to account for potential impacts on the downstream Tier II segment(s). The next section presents the review procedure for implementing the Tier II antidegradation policy in Maryland.

#### **4.2.3 Maryland's Antidegradation Implementation Procedures for Tier II Waters**

A summary of the key points of the Tier II antidegradation policy are listed below. Relevant sections of COMAR 26.08.02.04 – 1, which provides the most concise exposition of the implementation procedures, are presented in Appendix C; however, official copies of COMAR should be consulted for making regulatory decisions. The entire implementation policy can be found at Division of State Documents (DSD) website:

<http://www.dsd.state.md.us/comar/26/26.08.02.04%2D1.htm>

Before a new or expanded discharge can be permitted to a Tier II water, and before a change to a Water and Sewer Plan that would lead to such a discharge, the following three steps must be addressed:

1. Can the discharge be avoided or placed elsewhere? If so, that should be done.
2. If the discharge is necessary, has everything been done to minimize the water quality impact.
3. If the impact has been minimized to the greatest extent feasible, but an impact to water quality will still occur in the Tier II water, a social and economic justification for that impact must be prepared and approved by the Department, before the discharge can be permitted.

The Tier II implementation procedures are new, having been adopted in 2004. The State will provide assistance for questions relating to antidegradation review and compliance. The State will include this subject among the key topics for joint discussion with local government representatives during the coming year as the TMDL Implementation Guidance is refined.

#### **4.3 Restoring Water Quality**

A traditional view of water quality restoration involves the development and execution of implementation plans to meet water quality standards that are being violated. A technical overview, that addresses both pollutant loads and stream degradation, is provided in Appendix A. The remainder of this section focuses on managing the reduction of excessive pollutant loads<sup>6</sup>.

Traditional implementation plans identify cost-effective measures needed to achieve the necessary pollutant reductions to achieve standards and are often cast in the context of watershed planning. This traditional view, which is discussed below, has two shortcomings. First, it generally does not address the establishment of financial and regulatory incentives that remove

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<sup>6</sup> In terms of tiered water quality discussed in Section 4.2, this section addresses the common Tier I waters.

barriers and engender positive patterns of behavior (See Section 5.5 Economic and Regulatory Incentives). Second, it generally focuses solely on reducing existing pollutants, thereby failing to address new sources of pollutants.

This Guidance intentionally links both restoration and maintenance. It explicitly recognizes the value in leveraging resources from new pollutant sources to offset both new sources and existing excess loads. Existing State guidance developed under the Planning Act of 1992 advises that, for new development where standards are not attained, post-development water quality should be improved over pre-development levels<sup>7</sup>. This State policy is affirmed by the similar requirements for redevelopment projects, and in Maryland's Critical Areas law by what is commonly called the "10% Rule" for pollutant reduction. This topic is expanded on in Section 4.4, "Maintaining Water Quality: A Framework for Offsetting Future Loads."

The remainder of this section addresses the more traditional approach of developing and executing pollutant reduction plans in support of TMDL implementation.

#### **4.3.1 TMDL Implementation Planning for Pollutant Reductions**

The State has not provided a "how to" manual on developing TMDL implementation plans at this time. Instead, this Guidance emphasizes the importance of incorporating that planning across existing programs from land use planning on down. It is envisioned that a variety of different planning activities and documents will constitute the over-all plan, which can eventually be consolidated into "TMDL implementation plans" directly or by reference.

This section focuses on TMDLs expressed in terms of pollutant loads (mass per unit of time), and on nutrients in particular. This focus is justified by the fact that most of the TMDLs developed to date are for nutrient impairments of tidal waters, a primary type of water quality impairment in Maryland.

TMDLs provide a quantitative foundation for effective planning. A key element in Maryland's broad TMDL implementation strategy is to conduct this planning within the context of existing State and local programs. This will entail greater interaction between different governmental agencies that will share a role in the process. Section 4.3.2, "Executing Pollutant Reduction Plans," identifies most of the programs that should be involved in the planning and decision-making process.

Another aspect of Maryland's current strategy for addressing nutrient TMDLs is to build upon the Tributary Strategies for restoring the Chesapeake Bay. Because the pollutant loads that impair Bay waters originate upstream, fixing the Bay will necessitate fixing the local tidal tributaries for which TMDLs have been developed, and vice versa.

Maryland's Tributary Strategies constitute broad implementation plans for achieving and maintaining nutrient allocations for ten major watersheds. These allocations were established through the year-2000 Chesapeake Bay Agreement process. Upon completion of the

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<sup>7</sup> Maryland Department of Planning, 1993.

Chesapeake Bay Program's new watershed model in 2006, procedures will be developed in coordination with local governments to integrate Tributary Strategy planning with nutrient reduction planning for local TMDLs<sup>8</sup>. In the 2006, on-going nutrient reduction implemented at a local level will help to advance the mutual goals of TMDLs and the Tributary Strategies for the Chesapeake Bay.

In addition to building upon the Tributary Strategies, a process for documenting specific TMDL implementation plans is under consideration. The State's current thinking on TMDL implementation plans is outlined below:

#### Maryland's Current Thinking on TMDL Implementation Plans

- During 2006 and 2007, local governments should actively support development of refined Tributary Strategy implementation basin plans as part of Maryland's nutrient TMDL implementation planning process.
- In coordination with Tributary Strategies, future TMDL implementation plans will address Maryland 8-digit watershed basins; however, some plans will be developed at a more refined geographic scale, e.g., reservoirs.
- Future TMDL implementation plans should address multiple pollutants for a given waterbody.
- The degree of detail in implementation plans may vary depending on the nature of the case. Some might take the form of very brief documents containing general language, and citing external documentation regarding local programs that address key issues integral to the implementation process (e.g., watershed assessments developed under NPDES MS4 permits). Others may be more detailed, fully self-contained documents that include significant technical analyses within the implementation plan, rather than citing external documents.
- Local governments will have an opportunity to play a lead role in developing plans if they so choose. The specifics will be worked out in consultation with individual local governments.
- In some cases, it might be logical to adopt existing reporting frameworks to document the TMDL implementation plans. Examples might include reservoir management plans, WRASs, Tributary Strategies, or Comprehensive Conservation Management Plans.
- The State will track implementation plans via the State "Water Quality Management Plan" (WQM Plan) framework per 40 CFR 130.7. WQM Plans, organized by 6-digit basin codes, will incorporate completed TMDLs, identify the document that constitutes the implementation plan, and identify other appropriate supporting information.
- Implementation plans should address permitted point sources and the nine (9) basic elements of a nonpoint source watershed plan summarized below in Section 4.3.1.1.

The State will work with local government advisors to establish a process for documenting specific TMDL implementation plans. Given that the process is under consideration, it is not the intent of this current Guidance to provide detailed procedures on how to develop implementation plans for achieving pollutant reductions.

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<sup>8</sup> The new Phase 5 watershed model will be more geographically refined than the current Phase 4.3 model.

#### **4.3.1.1 EPA Guidance on Nonpoint Source Implementation Plans**

EPA's "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" (Part II.3.a-i), identifies nine (9) key nonpoint source elements to be addressed by TMDL implementation plans. The nine elements, which are summarized below, constitute good guidance for any watershed plan. The full text of the EPA watershed plan guidance is provided in Appendix C.

##### EPA "A – I" Guidance on NPS Watershed Planning

- a. Identify the sources or groups of similar sources that will need to be controlled to achieve the load reductions necessary to achieve water quality goals;
- b. Estimate the load reductions expected for the necessary management measures (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time);
- c. Describe the NPS management measures necessary to achieve the load reductions estimates established under paragraph (b) above and identify the critical areas in which those measures will be needed to implement this plan;
- d. Estimate the sources of technical and financial assistance needed, and/or authorities that will be relied upon, to implement this plan;
- e. Develop an information/education component to enhance public understanding of the project and encourage their participation in selecting, designing, and implementing the NPS management measures that will be implemented.
- f. Schedule implementation of the NPS management measures identified in this plan that is reasonably expeditious;
- g. Describe 2006, measurable milestones (e.g., amount of load reductions, or improvement in biological or habitat parameters) for determining whether NPS management measures or other control actions are being implemented;
- h. Develop a set of criteria that can be used to determine whether loading reductions are being achieved and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.
- i. Implement a monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under item (g) immediately above.

#### **4.3.1.2 Point Source Controls**

Industrial and municipal treatment plants are addressed by ensuring consistency of NPDES permits with TMDLs. For nutrients, Maryland's nutrient cap management strategy provides the framework for point source planning. Decisions regarding point source permits should also consider the viability of achieving nonpoint source reductions. This subject is discussed further in Section 4.4 on offsetting future loads, and Section 5.1.2.2 on tracking loads.

Stormwater managed under federal NPDES permits is defined as a point source for purposes of establishing and managing pollutant allocations in TMDLs. This includes both municipal and industrial categories of stormwater permits. TMDL implementation planning for nonpoint sources should take this distinction into account, striving to separate and track the municipal and industrial stormwater sources separately from the remaining nonpoint sources. This subject is discussed further in regard to stormwater and urban land cover in Section 5.1 on tracking.

The remainder of Section 4.3.1 provides broad implementation planning guidance. Additional TMDL implementation resources are referenced immediately below:

#### **4.3.1.3 Additional Implementation Planning Resources**

TMDL implementation planning is a rapidly evolving issue nationally. New information is emerging as states like Maryland begin to document their policies and procedures. Readers are encouraged to search the internet for new information. Several leads are provided below.

Virginia's TMDL Implementation Plan Development Guidance:  
<http://www.deq.virginia.gov/tmdl/ipguide.html>

Bacteria and Sediment TMDL Implementation Plans: Virginia has fairly extensive experience with TMDLs for bacteria. Although their TMDL development methodologies are different from those used in Maryland, the implementation actions identified in Section 6.0 of their bacteria implementation plans (IPs) have wide applicability. Their IPs also provide cost effectiveness information, which might prove useful <http://www.deq.virginia.gov/tmdl/iprpts.html>

Other potentially helpful resources regarding TMDL implementation planning are provided in Section 3.2 "Legal Landscape", and Section 5.2 "Tools and Resources."

#### **4.3.1.4 Reviewing the TMDL and Supporting Materials**

TMDL implementation planning should be founded on an understanding of the TMDL analysis. The essence of a TMDL analysis is to quantify the maximum amount of the impairing substance or stressor that the waterbody can assimilate without violating standards. Thus, the TMDL links a pollutant load to water quality standards. In doing so, the TMDL analysis defines a quantified framework for TMDL implementation.

In addition to reading the TMDL document, the following information should be reviewed prior to TMDL implementation planning.

- TMDL Technical Memoranda: Many TMDLs are accompanied by technical memoranda, which provide details on viable ways the total load can be divided among sources. These do not constitute formal allocations, but do provide potentially helpful implementation insights.
- 303(d) listing information, including documentation of the methodology used to make the listing determination: [http://www.mde.state.md.us/assets/document/AppndxC2004-303d\\_Final.pdf](http://www.mde.state.md.us/assets/document/AppndxC2004-303d_Final.pdf)
- All available water quality data, both in the receiving waterbody and in tributaries that discharge to the waterbody.
- Current inventory of pollutant sources including land use cover information, and an inventory of best management practices, which is maintained by MDE for nutrients.
- TMDL project technical materials. These include the detailed supporting computations and documentation archived in the TMDL administrative file after approval by EPA.

The required elements of a TMDL analysis are described briefly in Section 2.2 of this Guidance. These are described in more detail in Appendix J, and outlined below.

- Water Quality Target(s)
- Water Quality Impairment
- Source Assessment
- TMDL Allocations
- Technical Memorandum
- Reasonable Assurance of Implementation
- Other Key Assumptions and Insights

#### **4.3.1.5 Estimating Nonpoint Source Loads**

TMDL analysis reports for nutrients provide a simple estimate of the NPS load at the time the analysis was conducted. However, these estimates are likely to be outdated by the time a TMDL implementation planning effort is undertaken. Anticipating this, the TMDL documents refer to the NPS load as a “baseline” load rather than the “current” load.

There are a number of reasons for wanting to estimate NPS loads with regard to TMDLs. Some of these are listed below.

- Comprehensive Land Use Planning: Comparing the projected NPS load to the TMDL NPS allocation to assess consistency of the plan with the TMDL.
- Comparing the expected Tributary Strategy NPS loads to the TMDL NPS allocation. This serves as a simple test of the feasibility of achieving the TMDL, because the Tributary Strategy loads are considered to be very ambitious.
- Developing an NPS reduction plan to achieve the TMDL.
- Estimating NPS load increases due to land use changes associated with a development project.

- Estimating NPS load reductions due to NPS implementation activities.

One goal of this Guidance is to promote equity in decision-making across the State. In the context of estimating NPS loads, equity depends more on applying analysis methods consistently than on whether those methods produce precise estimates. This is one reason the Guidance advocates using simple, consistent methods of estimating NPS loads at the current time.

Another reason for using simple methods at this time is that NPS estimates are known to be highly uncertain. Measuring NPS loads is extremely difficult, and some question its technical feasibility<sup>9</sup>.

Yet another reason to adopt simple procedures that can be used consistently is that operational procedures are needed presently. There is little time to debate issues of precision, particularly when the estimates are known to be highly uncertain.

A reasonable way to proceed at the present time is to use the existing framework of the US EPA Chesapeake Bay Program for estimating NPS loads. Information is available for estimating loads for current and projected land cover, with and without BMP implementation. Despite imperfections, this recommended approach provides an internally consistent framework for decision-making, which is peer reviewed, acceptable to the US EPA and consistent with the regional Chesapeake Bay Agreement Tributary Strategies.

Appendix E provides guidance on how to access information and conduct several NPS loading analyses using spreadsheets. Those seeking to perform more sophisticated analyses are urged to contact MDE for technical support. During the coming years, the State will develop and adopt tools to support routine operational NPS loading analyses.

#### **4.3.1.6 Tracking and Assessing Progress**

Although the subject of tracking and assessing progress is addressed at length in Section 5.1 it is critical to consider within the context of the planning process. The ideal is to effectively manage an accounting ledger of pollutants for each TMDL. This implies the need to track both reductions and new sources. Given that new sources are often associated with changes to the land cover, tracking land cover changes is critical. Assessment also includes monitoring to evaluate progress. This topic is also addressed in Section 5.1

This Guidance acknowledges that significant TMDL implementation is already being done by local jurisdictions under a wide variety of programs. Local governments are urged to invest in improving the tracking already required under existing programs. Meaningful tracking

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<sup>9</sup> Attempting to measure the “current” annual NPS load poses a conundrum. Because precipitation changes from year to year, the NPS load is different each year. Consequently, the concept of an “annual load” typically refers to a multi-year average. For example, the “annual” load used to set goals in the Chesapeake Bay Agreement is actually based on a specific set of years with precipitation ranging from dry years to wet years. In order to measure a “typical” year for comparison with the Bay Agreement goals, it would be necessary to collect data over a number of years to deduce a comparable “average.” However, using multiple years of data conflicts with the notion of “current,” wherein lies the conundrum.

information will be a valuable asset for managing offsets, which could eventually be needed to justify increased loads associated with new development.

The reader is directed to Appendix E for additional guidance on assessing changes in nutrient loads according to methods that are consistent with the Chesapeake Bay Agreement and Maryland's Tributary Strategies. Section 4.4 discusses assessments for the purpose of offsetting future loads to maintain water quality.

#### **4.3.1.7 Guidance on Challenging Cases**

The needs for TMDL implementation vary from place to place. Some situations will be more challenging than others, particularly in areas designated to absorb future development. In those cases, local governments might consider adopting land use planning policies and design standards that will prevent increased water quality impacts. Making these decisions in the broader context of land use planning will help avoid the additional cost and delay of making such decisions on a project-by-project basis.

The development of a systematic framework to do this could be daunting. Fortunately, Maryland's Chesapeake Bay Critical Areas framework includes a set of planning and design tools that might provide insights. The goals and objectives of the Critical Areas Program provide a menu of options to consider. These address three broad areas for establishing systematic management policies and techniques:

- Policies on the location, density and types of development.
- Policies on how land is developed in order to mitigate adverse environmental impacts.
- Policies to promote environmentally sound farming and timber harvesting practices.

The details of the Critical Areas Program management criteria can be found at <http://www.dnr.state.md.us/criticalarea/>

As noted in Section 4.3.1.3, "Bounding the Load Reduction Goal," sensitivity analyses for pollution reduction planning can reveal particularly intractable challenges. If an analysis suggests that the pollution reduction goal appears to be clearly infeasible, a meeting with MDE staff to review the situation is warranted.

#### **4.3.1.8 Financial Planning**

The need for building technical and administrative capacity is a consistent theme throughout this guidance document. Equally important is the need to improve fiscal capacity. Local jurisdictions that are proactive in developing and implementing comprehensive, sustainable financing strategies will find it easier to contend with the water quality management challenges ahead.

The federal government recognizes this need, and has acted by making billions of dollars available to the agricultural sector through the Farm Bill. The State of Maryland has responded

as well, in part by enacting the Chesapeake Bay Restoration Fund to pay for upgrading wastewater treatment plants, septic systems and cover crops in the near term, and for other environmental needs in the future.

The keys to enable enhanced funding are 1) fiscal and administrative capacity to support the enhancements, 2) public recognition and support of the need to fund water quality management relative to other needs, 3) willingness of public elected officials, 4) a cadre of people to plan and execute new funding mechanisms.

There are numerous references to funding sources cited in Section 5.2 “Tools and Resources.” This section focuses on financial planning in a more conceptual way.

New funding should take advantage of recent advances of knowledge in this subject. In particular, while maintaining simplicity, funding systems should also be integrated with multiple objectives. This concept is conveyed through the following example.

### **Example Integrated Fee-based Funding System with Incentives**

*This example focuses on a fee-based approach to funding government services associated with land use change. Fee-based systems are important because they internalize costs that are otherwise outside the market; they link the source of the problem to the funded solution; and they provide for the long term operations, administration, and maintenance of programs needed to protect water quality. Other funding approaches are briefly noted below following this example.*

*This example strives to organize financial planning by subject, while also integrating the subjects. It addresses the two management objectives of this Guidance (Section 3.1.1): 1) Investing in future capacity (e.g., new land use planning procedures that explicitly addresses TMDLs) and 2) Continuing to perform today’s routine water quality protection activities (e.g., reviewing development plans and conducting site inspections). It also includes financial incentives as an explicit goal. In particular, one incentive is to influence new land development to locate in areas where it is desirable.*

- **Simple Concept:** Outline the key elements of the financing system. In the present example the key elements would fund a new land use planning methodology and increase staff for reviewing development plans and conducting site inspections. The incentives derive from identifying areas for development where regulatory procedures would be streamlined and additional staff would be made available to expedite the process. (See “Funding Method”).
- **Lay the Groundwork for Support:** Educate decision-makers about the needs, threats and opportunities. Explain how the funding system addresses each. Garner public support and consider documenting support via a simple public opinion survey.
- **Start-up Funding:** Secure a two-year budget to cover start-up costs of researching, developing and implementing a new fee system. Consider an agreement to refund these start-up costs from proceeds
- **Technical Elements:** The funding system is likely to depend on some technical analyses. In this example, it would be necessary to develop a land use plan overlay that classifies land

areas according to the degree of desirability for development from the perspective of smart growth and water quality protection. Cover these expenses by the start-up funds.

- The Funding Method: Design a fee system that 1) fully funds the review and inspection process (fee-for-service), 2) funds a portion of the new land use planning operations, 3) takes advantage of offset opportunities (See Section 4.4), 4) considers justification for sharing the cost between developers and the current residents, 5) pays back the original two-year budget item to the general fund, 6) charges differential fees according to the project location relative to the land use overlays (See Section 5.5 regarding “Economic and Regulatory Incentives.”). Ideally the accounting of these fees would use an enterprise fund, which is separate from the General Fund.
- Implementation: Enhance the land use planning, design review and inspection programs to 1) administer the new fee system, considering the establishment of an enterprise fund, 2) revise operational procedures, e.g., hire and train new staff, enhance the planning, review and inspection procedures, and 3) include a public education component to inform the permitted community about the new procedures.

Each element in the previous example would entail significant time and effort. This underlines the importance of starting this process soon.

Clearly, fee based programs are essential. However, they are just one tool available to local governments in their efforts to fund water quality programs. Effective financing strategies should consider a variety of approaches, including:

- Public and private funding assistance programs
- Effective laws and regulations
- Taxes and fees
- Effective use of debt, including subsidized programs such as the State Revolving Loan Fund
- Use of market-based programs
- Leveraging other community priorities, i.e. developing a comprehensive water resources protection strategy.

A number of government sources of funding are available to support TMDL implementation. Many of these are outlined in the “Maryland Water Quality Improvement Assistance Fact Sheet,” which is available on the web at:

[http://www.mde.state.md.us/assets/document/Water\\_Quality\\_Assistance\\_090804.pdf](http://www.mde.state.md.us/assets/document/Water_Quality_Assistance_090804.pdf)

One program in particular, the Clean Water Act Section 319 Nonpoint Source Program, provides over \$1 million/year in grants in Maryland. This grant is oriented toward implementing TMDLs to the degree that EPA has established minimum eligibility criteria to that end. See Appendix D.

Capital funds from MDE are made available on a competitive basis. Project proposals are ranked according to the “Integrated Project Priority System.” Thus, it is advantageous to plan projects with the priority system in mind. A web link to that ranking system is provided under the subsection “Financial Assistance,” in Section 5.2.2.

Financial planning is a highly specialized subject, to which much thought has been devoted by a variety of organizations. The remainder of this section briefly outlines some concepts and resources that might be helpful.

Financing Strategy: Developing and implementing a financing strategy is a process. Communities must accurately identify the increased level of service (that is essentially what this entire document is about); calculate the associated cost; gauge its capacity cover the costs; and then develop a strategy for increasing capacity.

The fee-based example above primarily addresses the capacity issue. It is essential to note that increased funding is only one aspect of the strategy. Effective financing institutions are also important, such as the enterprise fund mentioned in the example above.

Budget Planning: Although budgeting is routinely performed by separate agencies, the multi-disciplinary aspect of TMDL implementation necessitates interagency coordination. Budgeting should consider all the diverse resources, both public and private, that ensure sufficient staff and resources to meet program operations goals and capital enhancement goals. This implies that a functional plan exists. Often the functional plan and budgeting plan must be developed in an iterative way relative to each other.

Environmental Financing Experience in Maryland: The long history of restoring and protecting the Chesapeake Bay has generated substantial thought on financing environmental management. Some of the experiences that have been institutionalized can serve as resources.

- Two Blue Ribbon Panels: In 1995, the State of Maryland organized a Blue Ribbon Panel to explore alternatives for funding the Tributary Strategies that were completed in 1995. The document produced as a result still serves as a helpful guide. (Univ. MD, 1995).

In 2004 a Blue Ribbon Panel was convened to address the multi-billion dollar regional funding need on a more comprehensive scale. Because the approach was to “think big,” considering only funding approaches that would generate at least \$100 million per year, the outcome of this panel’s deliberations does not provide guidance for adoption by local governments. However, local governments should be fully engaged in the follow-up process of advocating for the ideas that were advanced by the Blue Ribbon Panel. For more information see: <http://www.efc.umd.edu/blueRibbon>

- Environmental Finance Center  
4511 Knox Road, Suite 205, College Park, MD 20740  
phone: (301) 403-4610, ext 24, fax: (301) 403-4222, email: [efc@umd.edu](mailto:efc@umd.edu)  
<http://www.efc.umd.edu/>
- Financing Alternatives for Water Quality: The EFC has developed matrices of financing alternatives for wastewater, the agricultural sector, developed lands, and forests.  
[http://www.efc.umd.edu/our\\_work/matrices.cfm](http://www.efc.umd.edu/our_work/matrices.cfm)

- Maryland Water Quality Improvement Assistance Fact Sheet  
[http://www.mde.state.md.us/assets/document/Wate\\_Quality\\_Assistance\\_090804.pdf](http://www.mde.state.md.us/assets/document/Wate_Quality_Assistance_090804.pdf)
- Stormwater Utilities: During the 1990s, MDE conducted research into the revenue generation potential of stormwater utility fee systems in Maryland (George, 1991). MDE also conducted a number of feasibility studies for local governments and invested in an education initiative. One outcome of that was the establishment of a stormwater utility in Takoma Park, Maryland.

Takoma Park, MD Stormwater Utility Ordinance

[http://www.stormwatercenter.net/Model%20Ordinances/misc\\_\\_takoma.htm](http://www.stormwatercenter.net/Model%20Ordinances/misc__takoma.htm)

Takoma Park, MD Stormwater Budget Ordinance for 2005.

<http://207.176.67.2/clerk/ordinances/2004/or200413.pdf>

#### **4.3.1.9 Planning Documentation**

In some cases, it might be logical to adopt existing reporting frameworks to document TMDL implementation plans. Examples include reservoir management plans, Tributary Strategies, the Environmental Element of a Comprehensive Land Use Plan, or Comprehensive Conservation Management Plans (e.g., the CCMP for the Maryland Coastal Bays). It is also possible to adopt a combination of plans, such as the Coastal Bay CCMP, which serves as an over-arching strategy that calls for more detailed, separate sub-basin plans.

The degree of detail in the initial implementation plans may vary depending on the case. Some plans might be very brief documents containing general language and citing external documentation regarding local programs that address key elements of the implementation process (e.g., citation of watershed assessments developed under NPDES MS4 permits). Others may be more sophisticated, fully self-contained documents that include significant technical data rather than citing external documents.

The State's current thinking on TMDL implementation plans is outlined in Section 3.3.2.1 "State Responsibilities," of the General Guidance section. As an initial step, it is likely that the State will work with local governments over the coming year or two to develop plans that include the minimum elements recommended by the US EPA (See Appendix D for a list of the minimum elements of a plan to qualify for federal nonpoint source grant funds).

#### **4.3.2 Executing Pollutant Reduction Plans**

TMDL implementation in Maryland will build upon existing programs rather than creating a new separate program. It is envisioned that local government coordinating committees, recommended in Section 3.4.1 of this Guidance, will steer the process of integrating existing local programs toward the common goal of executing TMDL implementation plans. However, local governments are free to adopt alternative approaches that might better suit their particular circumstances.

#### 4.3.2.1 Overview

Building TMDL implementation upon existing programs such as the Tributary Strategies is a strategic approach that envisions institutionalizing TMDL implementation into routine technical and administrative procedures. This approach recognizes that preventing increases in future pollutant loads is linked to the function of reducing current excessive loads. As expanded on below, existing State guidance developed under the Planning Act of 1992 advises that, for new development where standards are not attained, post-development water quality should be improved over pre-development levels<sup>10</sup>. This State policy is affirmed by the similar requirements for redevelopment projects, and in Maryland's Critical Areas law.

Integrating existing programs toward the common goal of TMDL implementation will take time. It will be important to simultaneously consider both near-field issues, like the protection of small non-tidal streams, and far-field issues, like the generation of nutrients that affect downstream waters. It will also be important to identify which programs that will address key TMDL implementation, such as source assessments, tracking of new sources and reductions, and creating offsets. It is also important to identify decision points within administrative procedures so that TMDL considerations can be included in operating procedure checklists. The following section begins to look at this with the understanding that State and local governments will need to collaborate on further refinements.

#### 4.3.2.2 Enhancing Existing Programs and Tools

Many existing programs are doing the work of TMDL implementation today. This Guidance recommends staying the course and continuing to use existing programs to make further advances in TMDL implementation. MDE considers continued incremental progress toward achieving TMDLs to be the 2006 measure of success.

To attain the ultimate goal of achieving and maintaining water quality standards, existing programs will need to be enhanced. Programs should be enhanced to obtain and analyze the information necessary to make decisions that account for TMDLs in a quantified manner.

The following brief outline identifies existing programs to be enhanced toward that goal, beginning with several general points. Appendix G elaborates on potential program enhancements and serves as road map, or checklist, for further consideration by State and local governments as this Guidance is refined.

- **Targeting:** Consider geographic targeting to benefit TMDL implementation in relation to the items below.
- **Tracking and Reporting:** Consider enhanced tracking of both new sources of pollution and pollution reduction actions. Reflect enhanced tracking in existing reporting frameworks.

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<sup>10</sup> Maryland Department of Planning, 1993.

Begin both technical and budget planning to upgrade information systems and databases to facilitate future tracking and reporting; offset planning should be central to this effort.

- **Inter-Unit Coordination:** Consider institutionalizing ways of ensuring coordination among governmental units to support consistent planning and decision making relative to TMDLs. For example, each key governmental unit could identify an individual to take the lead. These lead individuals could meet periodically to develop protocols for ensuring TMDL consistency. This group could select an over-all lead. Note: Each jurisdiction should already have a person who serves as the “TMDL Primary Contact” with MDE. Appendix H provides a list of the current local contacts.

Existing programs and functions (alphabetical order):

- Capital Programs
- Critical Areas Law
- Drinking Water Supply
- Erosion and Sediment Control
- Forest Conservation Law and Management in General
- Infrastructure Planning
- Land Use Planning and Implementing Ordinances
- Septic System Management
- Stormwater Management
- Soil Conservation District Functions
- Surface & Groundwater discharge permits:
- Waterways Permitting
- Wetlands Programs

Although this is a cursory outline it is intended to provide a needed road map for continued State and local dialogue about the means of executing pollution reduction plans (See Appendix G for elaboration). It should also be apparent that, in addition to reducing pollutants, many routine programs are witness to activities that result in the increase of pollutant loads. This demonstrates the logic of linking the management of pollution reduction to that of offsetting future loads.

#### **4.3.2.3 Incorporating Feedback from Experience – Adaptive Management**

Pollution reduction plans, whether for a broad area or specific site, tend to have an opportunistic component. That is, for reasons of practicality and efficiency, implementation plans adapt to the realities on the ground, such as the willingness of particular property owners to participate, the availability of particular funding, or physical constraints. The greater the investment in advance planning, the greater the certainty of the final result.

For complex situations, an adaptive management approach for implementation planning is often practical and helps to set reasonable expectations. This implies that post-implementation evaluation should be an explicit component of executing the implementation plan, and should be incorporated into the funding plan. This can often be done through various milestones for

measuring progress. Adaptive management concepts are particularly applicable to non-traditional TMDLs, in which the TMDL is expressed in terms of quantified implementation actions (See Section 2.3.3, “Non-Traditional TMDLs”).

When considering full-cost recovery fee systems, e.g., for offsetting future load increases, funding for post-evaluation and implementation refinements should be included; it is almost certain that follow-up steps will be needed to achieve full implementation.

#### **4.4 Maintaining Water Quality: A Framework for Offsetting Future Loads**

Although there are differing views on the inevitability of continued rapid growth, most jurisdictions will find it essential to plan for significant growth. In areas where water quality standards are barely attained, or where there are impairments, incorporating the impacts from growth into the planning process is critical. For example, if 100 acres of forested land are going to be replaced by residential development, nutrient loads are certain to increase. If a pending or existing TMDL implies the need to reduce nutrient loads, one might ask how it is that an increase is being allowed when the current loads are already too high. It is with that vexing question in mind that this guidance is being advanced.

This guidance proposes a simple two-part answer. First, develop an analysis showing that the excessive pollutants can be reduced to achieve the TMDL. Second, develop a technical and administrative framework for offsetting new loads. Much of the groundwork for the first step is being done in Maryland via the Tributary Strategies to implement the Chesapeake Bay Agreement nutrient goals. This was the topic of Section 4.3

The second step is the subject of this section. A technical overview, that addresses both pollutant loads and stream degradation, is provided in Appendix A. This section focuses on offsetting pollutant loads.

##### **4.4.1 Developing Procedures for Offsetting Future Loads**

In the simple case above, 100 acres of forested land with a unit nitrogen loading rate of 1.5 lbs/acre/yr is going to be converted to urban land with a loading rate of 7.5 lbs/acre/yr. According to figures provided by the Chesapeake Bay Program, the resultant nonpoint source nitrogen load is going to increase by about  $(7.5 - 1.5) \text{ lbs/acre/yr} \times 100 \text{ acres} = 600 \text{ lbs/yr}$ . In addition, if the development consists of 100 residential units, each generating about 250 gallons of municipal waste per day, another 304 lbs/yr will be generated for a total nitrogen increase of about 904 lbs/yr.

This guidance recommends adopting a reasonably simple 2006 computational framework to offset or compensate for these types of foreseeable load increases. The existing Chesapeake Bay Program loading rates, which reflect differences by region, provide a peer-reviewed framework that will enable consistent 2006 decision-making for those jurisdictions that choose to begin offsetting new pollutant loads.

It is possible to debate and refine numbers like these at great length; however, during that time the vexing question and the potential consequences posed above will remain unaddressed. In addition, adopting reasonable and fair computational procedures is only one aspect of an 2006 framework to be considered. Resources also need to be invested in identifying opportunities for offsets and in developing procedures for administering offsets.

#### **4.4.2 Technical and Administrative Procedures to Support Pollutant Offsets**

This section provides several examples of approaches for offsetting future increases in pollutants. The concept of offsetting future loads is implicit in federal law requiring TMDLs, which places a loading cap on impairing substances. It is also explicit in federal regulation prohibiting NPDES permits that would increase pollutant loads causing or contributing to an existing violation of water quality standards.

The concept is also well established in Maryland, both in broad policy and in operational form. In particular, Maryland is a signatory to the Chesapeake Bay Agreement, which calls for reducing and maintaining an upper bound on nutrient and sediment loads to the Bay and its tidal tributaries. In response, Maryland has established operational policies for point source discharges in the form of a “Nutrient Cap Maintenance Strategy.” The Strategy sets limits on both major and minor municipal treatment plants, and includes evolving procedures for allowing increases that are offset by decreases elsewhere. This framework can interface with nonpoint sources as described in several examples below.

State guidance on protecting sensitive areas, developed under the Planning Act of 1992, also voices a policy of offsetting future loads, which considers two cases<sup>11</sup>:

- 1) In areas that meet federal and State water quality standards, developers should strive to make post-development water quality as good as pre-development quality.
- 2) For development where standards are not attained (impaired waters) post-development water quality should be improved over pre-development levels.

The State’s perspective on pollutant offsets is also made operational for some nonpoint sources. Specifically, Maryland’s stormwater management law requires that redevelopment of areas that predate the law reduce the effective imperviousness through the incorporation of stormwater management practices. Operational guidance can be found in Maryland’s Stormwater Design Manual:

[http://www.mde.state.md.us/programs/waterprograms/sedimentandstormwater/stormwater\\_design/index.asp](http://www.mde.state.md.us/programs/waterprograms/sedimentandstormwater/stormwater_design/index.asp)

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<sup>11</sup> Maryland Department of Planning, 1993. The policy is actually broader than stated above, because it addresses all environmental matters.

This policy is also affirmed by what is commonly called the “10% Rule” for pollutant reduction required for development projects in the Intensely Developed Areas under Maryland’s Critical Areas law. Operational guidance can be found in the Critical Area 10% Rule Guidance Manual: [http://www.dnr.state.md.us/criticalarea/10percent\\_rule.html](http://www.dnr.state.md.us/criticalarea/10percent_rule.html)

State and federal wetlands programs also provide an example in which a finite resource is managed. In addition to avoiding wetlands loss, impacts must be offset through a formal mitigation process.

The previous examples demonstrate that a basis for developing a more comprehensive offset framework for protecting water quality currently exists. The following examples illustrate some specific ways in which offset decisions have been administered in Maryland. In addition, a hypothetical example on a watershed scale is introduced at the end of this section.

Point Source Offsets: Maryland’s Nutrient Cap Maintenance Strategy has established loading limits for the existing major and minor point sources, and for any new point source. As with any offset policy, an allowable increase must be offset by an equal or greater decrease elsewhere that ensures water quality standards are attained and maintained.

In one particular case, a small treatment plant requested an increase beyond its currently permitted flow. One option would have been to upgrade the treatment; in principle, if the effluent concentration is reduced in half, the flow can be doubled. However, treatment upgrades for small plants can be less cost-effective than alternative options.

In this case, a shift in accounting was made with a large treatment plant that was many years away from using its full flow capacity. The accounting record for the large plant’s flow cap was reduced a very small amount to offset an increase for the small plant. In time, after all of the major plants have been upgraded to Enhanced Nutrient Removal (ENR) technology, and funds from the Bay Restoration Fund are available to upgrade smaller plants, the small plant can be upgraded, and the temporary accounting transfer can be readjusted.

Septic System Connections: Maryland’s Nutrient Cap Maintenance Strategy has motivated other innovative offset concepts. MDE is considering operational procedures that would allow an increase in a treatment plant cap to support new development. In exchange, the developer would fund the connection of septic systems to an advanced treatment plant. Although the pound loadings involved in septic connections are not particularly large, current estimates are that about one new residential unit could be justified for every two units that are connected (this ratio is subject to change).

Although this operational procedure is still under development, it might include a requirement that the nutrient reduction more than offset the estimated nutrient increase to account for uncertainties in load reduction estimations and, where applicable, begin to reduce existing impairments. This procedure demonstrates both the viability of reducing loads via the process of offsetting new loads, and financing it by leveraging private sector resources.

Land Application of Municipal Waste Water (Spray Irrigation): In certain cases, converting a municipal surface water discharge to land application can be used to offset increases in nutrient loads. Although cost is presently often a barrier, developers might find it financially preferable to support the capital cost of converting to spray irrigation relative to other offset options.

It is in the interest of local jurisdictions to consider the feasibility of setting aside land in advance to use for future spray irrigation<sup>12</sup>. In addition to creating future options for offsets, this would prevent pollutant loads associated with septic systems. It would also promote efficient growth principles, thereby preserving the rural character of the surrounding countryside and helping to ensure the economic viability of local agriculture.

A Comprehensive Offset Policy for Nutrients: To date, Maryland has dealt with nutrient removal offsets on a case-by-case basis; a comprehensive policy is under development. It is expected that the policy will build on the Nutrient Cap Maintenance Strategy for point sources and outline the basic requirements for adherence to water quality standards. These requirements are reflected operationally by both local nutrient TMDLs and the Chesapeake Bay nutrient limits.

Because a TMDL allocation falls under the rules and authority of the federal National Pollution Discharge Elimination System (NPDES), it cannot be viewed as a property right. A waste load allocation may be assigned to a specific facility only through issuance or modification of an NPDES discharge permit. Any assignment of TMDL allocations to point source facilities must follow existing NPDES permit rules, including those for waste load allocations, water quality permit limitations, best available technology requirements, public participation, etc., none of which convey any property or ownership rights.

Tracking and assessing pollutant sources and control practices will be a significant technical aspect of this policy. Section 5.1.2.2 discusses the tracking of point source allocations, including regulated stormwater.

#### A Watershed Planning Perspective:

Appendix F provides a hypothetical example that is intended to illustrate the kinds of issues that might be contemplated when considering nitrogen offsets from a watershed perspective. The example includes point sources and nonpoint sources (the concepts would be similar for phosphorus).

In summary, the watershed planning example in Appendix F demonstrates that a wide variety of options can be considered for offsetting new pollutant sources. Overall, the examples provided in this section are intended to highlight the importance of investing in developing the technical and administrative capacities to plan for and execute offsets. Planning in advance for future offsets will not only save time and money, it could maintain an option that might otherwise be irreversibly lost (e.g., foreclosing the option of spray irrigation by failing to set land aside).

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<sup>12</sup> The land set aside for spray irrigation shall meet the site characteristics requirements such as groundwater table depth, depth to bedrock permeable soil and adequate buffer zone to neighbor's property and waterways etc.

Those jurisdictions that begin making these investments in offset planning are likely to have a competitive advantage for supporting development in the future.